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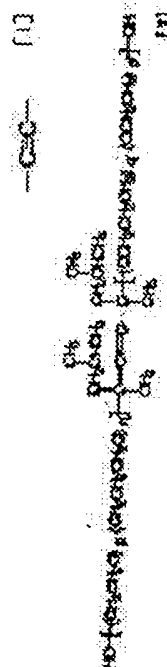
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(54) DETERGENT FOR COPPER WIRING SEMICONDUCTOR SUBSTRATE

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a detergent capable of effectively removing impurities on the surface of a semiconductor having a copper wiring on the surface without causing corrosion and oxidation of the copper wiring and surface roughness and to provide a method for cleaning.

SOLUTION: This detergent for the surface of a semiconductor having a copper wiring on the surface comprises a nonionic surfactant containing a group of formula (1) in the molecule, for example, a nonionic surfactant of general formula 7 ($p+q+p'+q'$ is 1-20). This method for cleaning the surface of a semiconductor uses the detergent. This semiconductor having a copper wiring on the surface is obtained by treating the surface a semiconductor with the detergent.



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* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

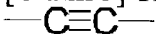
[Claim 1] The cleaning agent for semi-conductor front faces with which copper wiring was given to the front face which comes to contain the Nonion nature surfactant.

[Claim 2] The Nonion nature surfactant is [Formula 1] in a molecule.



A cleaning agent given in any of claim 1 which is what comes out and has the radical shown they are.

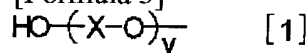
[Claim 3] The Nonion nature surfactant is [Formula 2] in a molecule.



A cleaning agent given in any of claim 1 which is what comes out and has the radical shown and a polyoxyalkylene group they are.

[Claim 4] The cleaning agent according to claim 3 whose polyoxyalkylene group is what is shown by the following general formula [1].

[Formula 3]

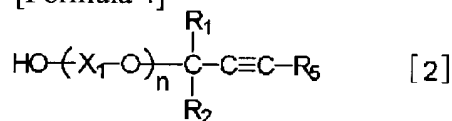


(X shows an alkylene group among a formula and y shows a positive integer.)

[Claim 5] The cleaning agent according to claim 3 whose polyoxyalkylene group is a polyoxyethylene radical or/and a polyoxypropylene radical.

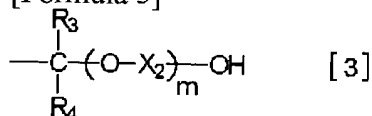
[Claim 6] The cleaning agent according to claim 1 whose Nonion nature surfactant is what is shown by the following general formula [2].

[Formula 4]



X₁ shows a low-grade alkylene group among [type, n shows a positive integer, R₁ and R₂ show independently a hydrogen atom, a hydroxyl group, an alkyl group, or a hydroxyalkyl radical, respectively, and R₅ shows the radical shown by a hydrogen atom, the hydroxyl group, the alkyl group, the hydroxyalkyl radical, or the following general formula [3].

[Formula 5]



(R₃ and R₄ show independently a hydrogen atom, a hydroxyl group, an alkyl group, or a hydroxyalkyl radical among a formula, respectively, X₂ shows a low-grade alkylene group, and m shows a positive

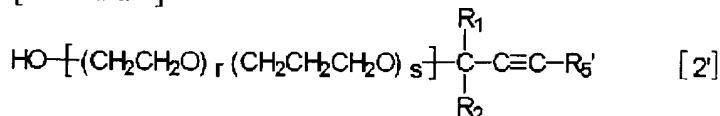
for formula III

integer.)]

[Claim 7] It is the cleaning agent according to claim 6 whose R5 is the radical shown by the general formula [3] in a general formula [2] and n X1 and whose m X2 are ethylene or a propylene radical independently, respectively.

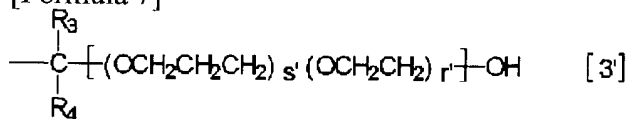
[Claim 8] The cleaning agent according to claim 1 whose Nonion nature surfactant is what is shown by the following general formula [2'].

[Formula 6]



R1 and R2 show independently a hydrogen atom, a hydroxyl group, an alkyl group, or a hydroxyalkyl radical among [type, respectively, r and s show 0 or a positive integer independently, respectively, and R5' shows the radical shown by a hydrogen atom, the hydroxyl group, the alkyl group, the hydroxyalkyl radical, or the following general formula [3']].

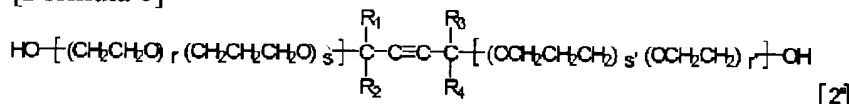
[Formula 7]



(R3 and R4 show independently a hydrogen atom, a hydroxyl group, an alkyl group, or a hydroxyalkyl radical among a formula, respectively, and r' and s' show 0 or a positive integer independently, respectively.) However, r, s, r', and s' remove the case of 0 to coincidence.]

[Claim 9] The cleaning agent according to claim 1 whose Nonion nature surfactant is what is shown by the following general formula [2''].

[Formula 8]

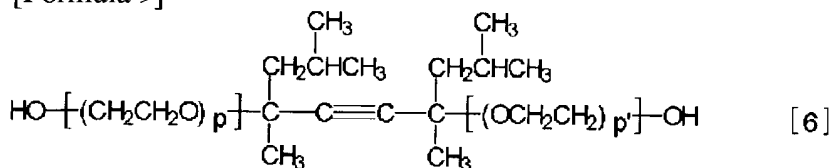


Formula

(R1, R2, R3, R4, r, r', s, and s' is the same as the above among a formula.)

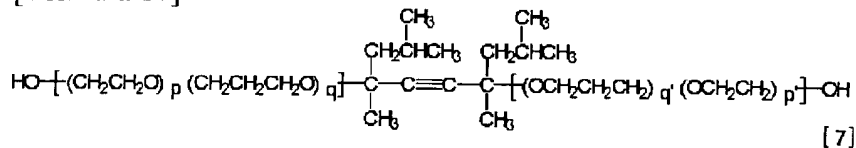
[Claim 10] The cleaning agent according to claim 1 whose Nonion nature surfactant is what is chosen from the compound shown by the following general formula [6], [7], or [8].

[Formula 9]



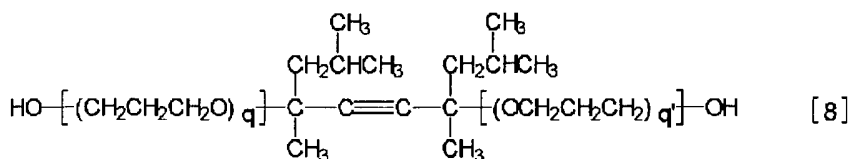
(p+p' is 1-20 among a formula.)

[Formula 10]



(p+q+p'+q' is 1-20 among a formula.)

[Formula 11]



(q+q' is 1-20 among a formula.)

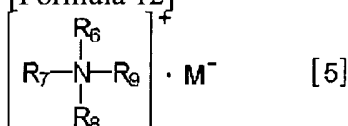
[Claim 11] A cleaning agent given in any of claims 1-10 which are alkalinity they are.

[Claim 12] Furthermore, a cleaning agent given in any of claims 1-11 which come to contain a nitrogen-containing alkalinity compound they are.

[Claim 13] The cleaning agent according to claim 12 with which a nitrogen-containing alkalinity compound is chosen from ammonia, primary amine, the second class amine, the third class amine, or the fourth class ammonium.

[Claim 14] The cleaning agent according to claim 13 the fourth class ammonium of whose is the fourth class ammonium shown by the following general formula [5].

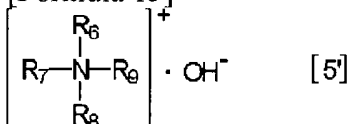
[Formula 12]



(R6-R9 show among a formula the hydrocarbon residue which may have the hydroxyl group independently, respectively, and M- shows an anion.)

[Claim 15] The cleaning agent according to claim 14 which is that the fourth class ammonium shown by the general formula [5] is indicated to be by the following general formula [5'].

[Formula 13]

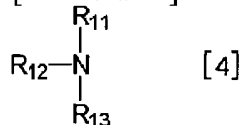


(R6-R9 show independently the low-grade alkyl group of carbon numbers 1-6, or the hydroxy low-grade alkyl group of carbon numbers 1-6 among a formula, respectively.)

[Claim 16] The cleaning agent according to claim 15 the fourth class ammonium of whose shown by the general formula [5] is tetramethylammonium hydroxide or hydroxylation trimethyl-2-hydroxyethyl ammonium.

[Claim 17] The cleaning agent according to claim 13 which is that ammonia, primary amine, the second class amine, or the third class amine is indicated to be by the following general formula [4].

[Formula 14]



(R11, R12, and R13 show independently a hydrogen atom, a low-grade alkyl group, or a hydroxy low-grade alkyl group among a formula, respectively.)

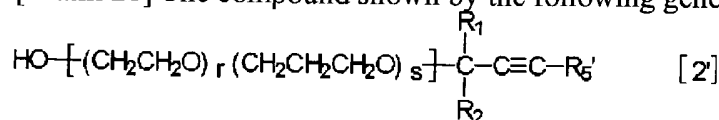
[Claim 18] The washing approach on the front face of a semi-conductor characterized by processing the semi-conductor front face where copper wiring was given to the front face with a cleaning agent given in any of claims 1-17 they are that copper wiring was given to the front face.

[Claim 19] The washing approach on the front face of a semi-conductor characterized by giving the semi-conductor front face where copper wiring was given to the front face to a physical washing process under existence of a cleaning agent given in any of claims 1-17 them are.

[Claim 20] The semi-conductor with which copper wiring was given to the front face obtained by

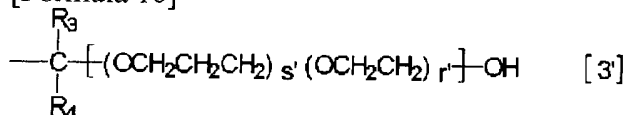
washing the semi-conductor front face where copper wiring was given to the front face by the approach according to claim 18 or 19.

[Claim 21] The compound shown by the following general formula [2'] [** 15]



R1 and R2 show independently a hydrogen atom, a hydroxyl group, an alkyl group, or a hydroxyalkyl radical among [type, respectively, r and s show 0 or a positive integer independently, respectively, and R5' shows the radical shown by a hydrogen atom, the hydroxyl group, the alkyl group, the hydroxyalkyl radical, or the following general formula [3'].

[Formula 16]

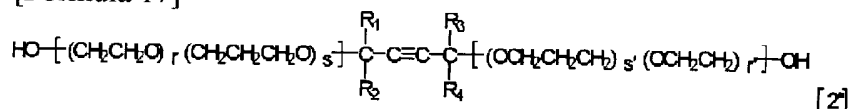


(R3 and R4 show independently a hydrogen atom, a hydroxyl group, an alkyl group, or a hydroxyalkyl radical among a formula, respectively, and r' and s' show 0 or a positive integer independently, respectively.)

However, r, s, r', and s' remove the case of 0 to coincidence.] The semi-conductor substrate cleaning agent which comes to contain a nitrogen-containing alkalinity compound.

[Claim 22] The cleaning agent according to claim 21 which is the compound in which the compound shown by the general formula [2'] is shown by the following general formula [2''].

[Formula 17]



(R1, R2, R3, R4, r, r', s, and s' is the same as the above among a formula.)

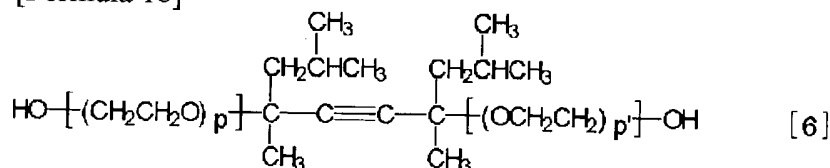
[Claim 23] The cleaning agent according to claim 22 R1 and whose R3 are methyl groups in a general formula [2''] and R2 and whose R4 are isobutyl radicals.

[Claim 24] The cleaning agent according to claim 22 or 23 whose totals of r, r', s, and s' are 1-20 in a general formula [2''].

[Claim 25] The cleaning agent according to claim 22 or 23 whose totals of r, r', s, and s' are 1-18 in a general formula [2''].

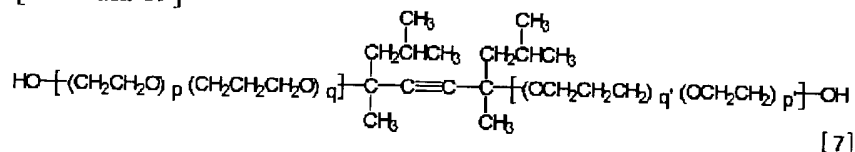
[Claim 26] The cleaning agent according to claim 22 which is that as which the compound shown by the general formula [2''] is chosen from the compound shown by the following general formula [6], [7], or [8].

[Formula 18]



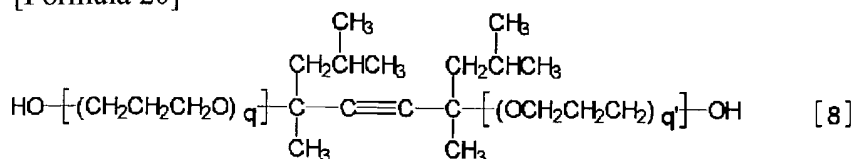
(p+p' is 1-20 among a formula.)

[Formula 19]



(p+q+p'+q' is 1-20 among a formula.)

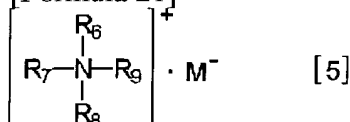
[Formula 20]



(q+q' is 1-20 among a formula.)

[Claim 27] The cleaning agent given in any of claims 21-26 they are chosen from the fourth class ammonium in which a nitrogen-containing alkalinity compound is shown by ammonia, primary amine, the second class amine, the third class amine, or the following general formula [5].

[Formula 21]

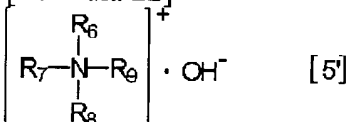


(R6-R9 show among a formula the hydrocarbon residue which may have the hydroxyl group independently, respectively, and M- shows an anion.)

[Claim 28] A cleaning agent given in any of claims 21-26 which are the fourth class ammonium in which a nitrogen-containing alkalinity compound is shown by the general formula [5] they are.

[Claim 29] The cleaning agent according to claim 28 which is that the fourth class ammonium shown by the general formula [5] is indicated to be by the following general formula [5'].

[Formula 22]



(R6-R9 show independently the low-grade alkyl group of carbon numbers 1-6, or the hydroxy low-grade alkyl group of carbon numbers 1-6 among a formula, respectively.)

[Claim 30] The cleaning agent according to claim 28 or 29 whose hydrocarbon residue shown by R5-R6 in a general formula [5] or [5'] is an alkyl group.

[Claim 31] The cleaning agent according to claim 30 whose alkyl group shown by R5-R6 is a methyl group.

[Claim 32] The cleaning agent according to claim 29 the fourth class ammonium of whose shown by the general formula [5'] is tetramethylammonium hydroxide or hydroxylation trimethyl-2-hydroxyethyl ammonium.

[Claim 33] A cleaning agent given in any of claims 21-32 whose semi-conductor substrates are semi-conductor substrates with which copper wiring was given to the front face they are.

[Claim 34] The semi-conductor substrate washing approach characterized by processing a semi-conductor front face with a cleaning agent given in any of claims 21-32 they are.

[Claim 35] The washing approach according to claim 34 that a semi-conductor substrate is a semi-conductor substrate with which copper wiring was given to the front face.

[Claim 36] The semi-conductor substrate obtained by washing a semi-conductor front face by the approach according to claim 34 or 35.

[Translation done.]